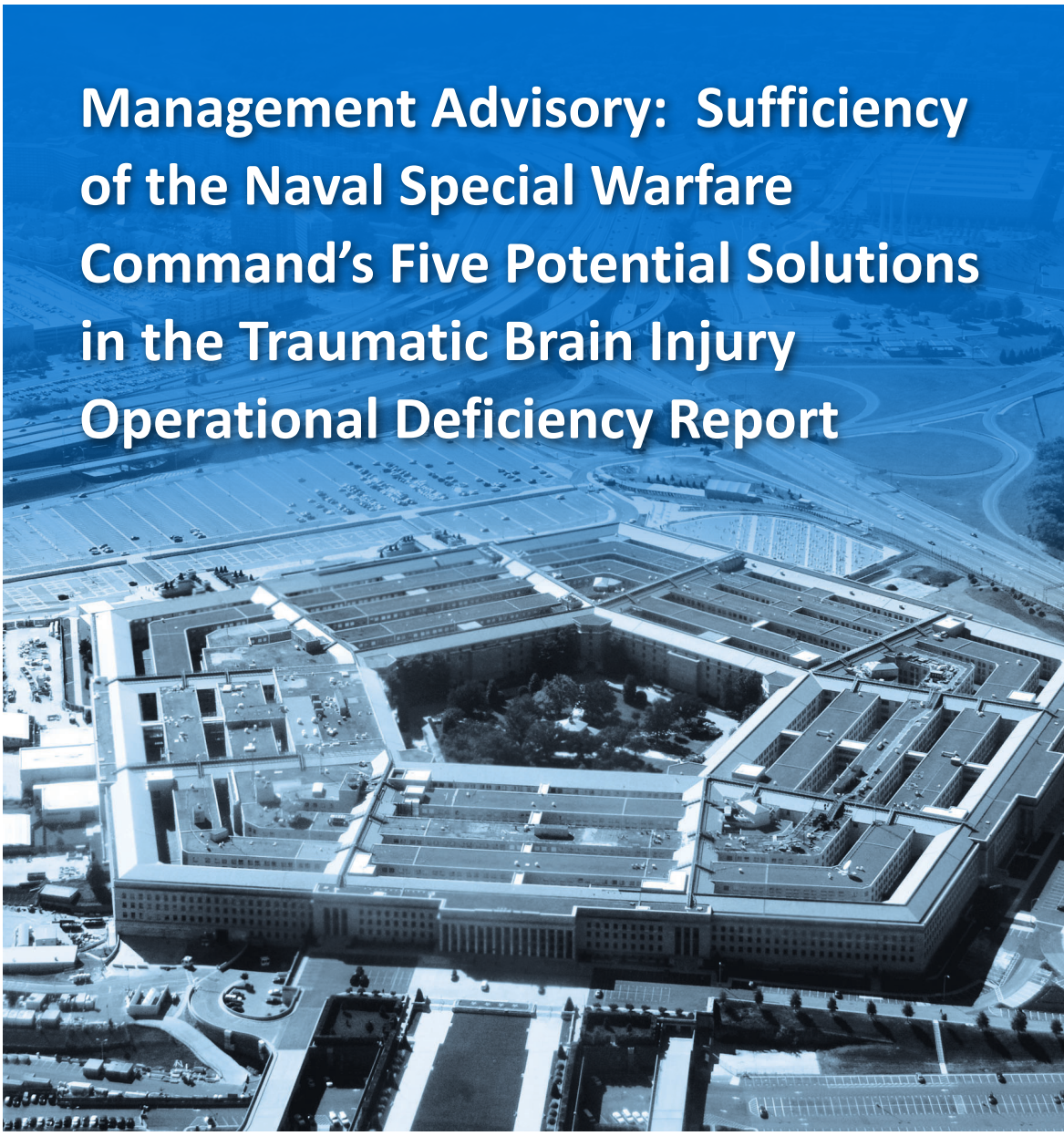
Report No. DODIG-2026-074

INSPECTOR GENERAL

U.S. Department of Defense

MARCH 30, 2026

Management Advisory: Sufficiency of the Naval Special Warfare Command's Five Potential Solutions in the Traumatic Brain Injury Operational Deficiency Report



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March 30, 2026

MEMORANDUM FOR NAVAL SPECIAL WARFARE COMMAND

SUBJECT: Management Advisory: Sufficiency of the Naval Special Warfare Command's Five Potential Solutions in the Traumatic Brain Injury Operational Deficiency Report (Report No. DODIG-2026-074)

This final management advisory identifies concerns found during the DoD Office of Inspector General's "Evaluation of the Effectiveness of DoD Policies and Procedures for Identifying and Evaluating Traumatic Brain Injury for Naval Special Warfare Personnel" (Project No. D2025-DEV0HB-0129.000). We previously provided copies of the draft management advisory and requested written comments on the recommendations. We received comments from the Naval Special Warfare Command Inspector General on behalf of the Commander, Naval Special Warfare Command (NAVSPECWARCOM) agreeing with recommendations 1.a and 1.b without further comment. Therefore, the recommendations are resolved but will remain open. We will close the recommendations once we verify that management actions taken fully address the recommendations.

We conducted this evaluation from July 2025 through January 2026 in accordance with the "Quality Standards for Inspection and Evaluation," published in December 2020 by the Council of the Inspectors General on Integrity and Efficiency. To conduct our evaluation, we identified and reviewed the Commander, Naval Special Warfare Group Four's (CNSWG-4) July 15, 2024, Operational Deficiency Report (ODR) to the NAVSPECWARCOM.[1] We also reviewed the actions NAVSPECWARCOM initiated to respond to the ODR. We conducted a site visit to Naval Special Warfare Group Four (NSWG-4) at Joint Expeditionary Base Little Creek/Fort Story, Virginia, and verified the concerns presented in the ODR by interviewing NSWG-4 engineers and observing an operational Combatant Craft Assault (CCA) with no shock mitigation system.

According to NAVSPECWARCOM, its mission is to train, equip, and maintain combat readiness for Naval Special Warfare (NSW) forces, including Special Warfare Combatant Craft Crewmen (SWCCs), the specially selected and trained special operations forces who operate NSW combatant and other craft in maritime, coastal, and riverine environments. According to the NSWG-4, it is the command headquarters for NSW special boat teams, whose high-speed boat fleets include the CCA, Combatant Craft Medium, and Combatant Craft Heavy.

[1] CNSWG-4 ODR, "Operational Deficiency Report for Crew Shock Mitigation System Combatant Craft Assault," July 15, 2024. NSWG4 reissued an unclassified version of the ODR on March 10, 2026, and provided a copy to the DoD OIG. See the Appendix for a copy of the unclassified ODR.

A 2025 information paper from the Military Health System's Traumatic Brain Injury Center of Excellence states that crewmembers operating high-speed boats, particularly SWCCs, are frequently exposed to hull impacts induced by wave-slamming, resulting in an increased risk for musculoskeletal injuries of the lower back and neck, as well as chronic pain and head injuries.[2] In addition, U.S. Special Operations Command Directive 40-6 states that traumatic brain injuries (TBIs) "can result from acute or repetitive impact, blast exposure, and acceleration or deceleration forces." These forces, such as the hull impacts, are the type that SWCCs experience.[3] The Directive describes the clinical signs that appear or worsen right after trauma, including:

- a change in mental status, such as confusion or disorientation;
- memory loss of events right before or after the injury; and
- any loss or decreased level of consciousness.

During our evaluation, we observed a CCA at Joint Expeditionary Base Little Creek/Fort Story that did not have crew shock mitigation technology installed.[4] NSWG-4 engineers explained that this is normal—the CCAs do not have a shock mitigation system. In addition, we found that the concerns we identified during our evaluation regarding impact exposure were already formally documented in a July 15, 2024, ODR on CCAs, sent from the CNSWG-4 to the NAVSPECWARCOM Commander. According to the ODR, the CCA's console design requires operators to stand in a slouched, forward posture to reach the controls. Specifically, this posture exacerbates the vertical head accelerations that occur with each mechanical shock or vibration. The CNSWG-4's ODR details the critical operational deficiencies of CCAs and proposes potential impact mitigation strategies. According to the ODR report, the key CCA deficiencies include:

- no shock-mitigation system to protect CCA operators from short- or long-term physical harm,
- potential impacts because of console design,
- lack of real-time shock sensors, and
- no smart craft technology.[5]

[2] Traumatic Brain Injury Center of Excellence, "Information Paper on Military High-Speed Boat Injuries," February 2025. The Traumatic Brain Injury Center of Excellence is a congressionally mandated collaboration of the DoD and Veterans Affairs to promote state-of-the-science care from point-of-injury to reintegration for Service members, veterans, and their families to prevent and mitigate consequences of mild to severe TBI.

[3] U.S. Special Operations Command Directive 40-6, "Medical Services: Comprehensive Strategy for Special Operations Forces Warfighter Brain Health," September 11, 2023.

[4] According to the CNSWG-4, a shock mitigation system is a series of technologies to address CCA shock mitigation to decrease orthopedic and traumatic brain injuries to craft operators.

[5] Smart craft technology, such as active ride control, focuses on the technology actively sensing and adjusting the trim tabs on the CCA to combat pitch and roll of the craft (keep the craft steadier) but still allow the crewmember to adjust manually if required.

The ODR states that these operational deficiencies must be addressed for several reasons to reduce exposure to repetitive impacts. First, repetitive impacts significantly degrade immediate performance and can result in long-lasting medical problems. For example, NSWG-4 cited that TBIs, in both acute and chronic forms, may result in a degradation of the health of the force and its long-term sustainability. Additionally, impact injuries can be magnified when wearing necessary equipment, such as body armor, helmets, and night vision goggles, resulting in an increased level of TBI and neck and spinal trauma.

In the ODR, the CNSWG-4 proposed five potential solutions to these deficiencies, as well as the corresponding benefits of implementing the solutions, such as return on investment and reducing risk to the mission. ODR solutions include:

- seats that allow various positions,
- a centralized data-analysis monitoring system to report craft and crew shock and whole-body vibration exposures,
- an active ride-control system,
- head and neck support devices, and
- a market analysis of proven or experimental technology.

The CNSWG-4 explained in the ODR that these solutions could decrease operator injuries, strengthen combat readiness, and increase operator longevity.

On August 25, 2025, the NAVSPECWARCOM force medical officer took initial actions to reduce exposure to repetitive impacts by approving the "Blast Overpressure, Acceleration, and Cognitive Testing in SWCC" (BOATS) research study protocol. The BOATS protocol is designed to identify the impact of combined acceleration and blast overpressure forces on brain health. The protocol proposes investigating cognitive, physiological, and physical symptoms associated with SWCC training operations in different training environments and across multiple SWCC platforms. According to the NSWG-4 force medical team, functional assessments such as learning, memory, balance, and reaction time testing provide insights into the acute cognitive and physical impacts of exposure, while blood biomarkers quantify cellular brain injury. By analyzing post-exposure data against baseline measures, the BOATS study aims to provide NSW with insight into training impacts on SWCC personnel, specifically blast- and acceleration-specific concerns, as well as potential funding for mitigation opportunities. According to the force medical team, the BOATS study is enrolling study participants and is scheduled for completion by June 30, 2027.

Although the BOATS protocol is testing shock effects with SWCC on CCA craft and will provide NSW with insight into training impacts on SWCC personnel, the protocol does not address the five potential solutions proposed in the ODR. Without implementing and addressing all five potential ODR solutions, CCA operations may continue to expose crewmembers to blast and acceleration forces.

Therefore, the NAVSPECWARCOM Commander should review and validate the five potential solutions identified in the ODR and assess whether the solutions are sufficient to meet the required operational standards and resolve the identified deficiencies. In addition, the NAVSPECWARCOM Commander should develop a plan of action with milestones to address the potential solutions detailed in the ODR or identify alternative solutions and develop a corresponding plan of action with milestones.

According to the NAVSPECWARCOM medical officer, boat operators and crewmembers are exposed to acceleration forces when operating combatant craft and blast from firing heavy weapons. The medical officer also stated that combined exposures, reported symptoms, and high injury rates warrant significant attention. According to the CNSWG-4, the Crew Shock Mitigation System is necessary to reduce risk to force, increase operational availability, reduce lost workdays, and prevent the loss of SWCC operators to single-impact events. The CNSWG-4 also stated that the risk to the force operating under current conditions degrades health and readiness and may continue to severely limit or disable operators.

Recommendations, Management Comments, and Our Response

Recommendation 1

We recommend that the Commander of the Naval Special Warfare Command:

a. **Review and validate the potential five solutions identified in the Operational Deficiency Report to assess if the solutions are sufficient to meet the required operational standards and resolve the identified deficiencies.**

b. **Develop a plan of action with milestones to implement and address all five potential solutions identified in the Operational Deficiency Report or identify and explain alternative solutions if the five potential solutions do not resolve the identified deficiencies.**

Management Comments

The Naval Special Warfare Command, Force Inspector General, responding for the NAVSPECWARCOM, agreed with the recommendations without further comment.

Our Response

Comments from the NAVSPECWARCOM partially addressed the recommendations; therefore, recommendations 1.a and 1.b are resolved but will remain open. We will close the recommendations once we verify that NAVSPECWARCOM has validated the proposed solutions in the ODR and developed a plan of action with milestones to implement the validated solutions or suitable alternatives.

If you have any questions, please contact [redacted]

Bryan Clark

Bryan T. Clark
Assistant Inspector General for Evaluations
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Management Comments

Naval Special Warfare Command

DEPARTMENT OF THE NAVY
NAVAL SPECIAL WARFARE COMMAND
2000 TRIDENT WAY
SAN DIEGO CA 92155-5599

18 Mar 2026

Naval Special Warfare Command Information Paper

(U) Subject: NAVSPECWARCOM concurrence with DoD IG's 23 December 2025 Draft Management Advisory (Project D2025-DEV0HB-0129.001)

1. (U) Commander of the Naval Special Warfare Command concurs, without comment, with the recommendations of Department of Defense Inspector General Management Advisory: Sufficiency of Naval Special Warfare Commands Five Potential Solutions in the Traumatic Brain Injury Operation Deficiency Report.

J. G. STEWART
CAPT USN
Force Inspector General
By direction

Appendix

Operational Deficiency Report for the Combatant Craft Assault

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DEPARTMENT OF THE NAVY
NAVAL SPECIAL WARFARE GROUP FOUR
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VIRGINIA BEACH VA 23459-2845

9072
N00
10 Mar 26

From: Commander, Naval Special Warfare Group FOUR
To: Commander, Naval Special Warfare Command

Subj: (U) OPERATIONAL DEFICIENCY REPORT (ODR) FOR CREW SHOCK MITIGATION SYSTEM ON COMBATANT CRAFT ASSAULT (CCA)

Ref: (a) (U) Analysis and Mitigation of Mechanical Shock Effects on High-Speed Planing Boats. Thesis (S.M.)-Massachusetts Institute of Technology, Dept. of Ocean Engineering, 2001
(b) (U) NSWCCD-80-TR-2015/001
(c) (U) DODI 6490.11
(d) (U) COMNAVSPECWARGRUFOURINST 6010.3
(e) (U) NSWCCD-23-TM-2011/01
(f) (U) U.S. Army Aeromedical Research Laboratory, Musculoskeletal Injuries to Human Neck and Effects of Head-Supported Mass Worn by Soldiers, October 2005, USAARL-CR-2006-01
(g) (U) NSWCCD-83-TM-2022/34
(h) (U) Small-Boat Operators Are Overexposed to Whole-Body Vibration, Proceedings August 2020, LCDR Ryan Butler, USCG
(i) (U) Naval Special Warfare Navigation Plan 2024 (SECRET//NOFORN)

Encl: (1) (U) NSWG-4 Memorandum for the Record. April 2022. Chronic Orthopedic/MTBI problems in Selected Navy Ratings.
(2) (U) T9006-AE-TRQ-010, Laboratory Test Requirements for Evaluating the Mechanical Shock Attenuation Performance of Marine Shock Isolation Seats. February 2019.

CCA CREW SHOCK MITIGATION SYSTEM ODR

1. (U) Operational Requirement. Naval Special Warfare (NSW)'s Combatant Craft Assault (CCA) routinely conduct high risk missions in all sea states and weather conditions. These mission profiles require high craft speeds and abrupt maneuvers.

2. (U) Operational Deficiency

a. (U) High-speed operations, combined with the factors of boat design and ocean waves, result in an adverse mechanical shock environment for personnel and equipment. The operational deficiency has multiple elements.

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Operational Deficiency Report for the Combatant Craft Assault (cont'd)

UNCLASSIFIED

Subj: (U) OPERATIONAL DEFICIENCY REPORT (ODR) FOR CREW SHOCK MITIGATION SYSTEM ON COMBATANT CRAFT ASSAULT (CCA)

(1) (U) The CCA has no shock mitigation system to protect the CCA operators from short or long-term physical harm.

(2) (U) Craft console design forces operators to stand in a slouched forward posture to reach the controls. This posture exasperates the vertical head accelerations that occur with each mechanical shock or vibration.

(3) (U) CCA operators lack real-time shock sensors to advise or warn the crew of actual shock magnitude.

(4) (U) The CCA is not outfitted with smart craft technology, such as Active Ride Control (ARC).

b. (U) Exposure to repetitive impacts has a significant detriment to immediate performance and many long-lasting medical ailments. The Naval Special Warfare Group FOUR (NSWG-4) Medical Department documented the physical impact to Special Warfare Combatant Craft Crewmen (SWCC) (Enclosure 1) that resulted from repetitive mechanical shocks to the body. In this memorandum, NSWG-4 cites orthopedic problems in the neck, leg joints, lower back, lumbar, and spinal discs as well as traumatic brain injury (TBI) in both acute and chronic forms, thereby degrading the health of the force and its long-term sustainability. Injuries are magnified when wearing body armor and head-supported mass (HSM) (i.e. helmets, nigh vision goggles (NVGs), headsets, etc.) resulting in an unacceptable level of TBI, neck and spinal trauma using the abbreviated injury scale (AIS).

c. (U) Mathematical models designed to represent the small craft environment showed the head, neck, torso responded to impacts with horizontal accelerations of 5g at the pelvis can generate vertical head accelerations from 20g to 28g and with a horizontal acceleration of up to 12g. The resultant head acceleration was in the range of 60g's with rotational accelerations of up to 4500 Radian per second (rad/sec) (Enclosure 1).

d. (U) Without a shock and whole-body vibration (WBV) mitigation system to reduce the severity of shock, vibration, neck flexion, spinal compression and other musculoskeletal injuries, the continued frequent and long duration exposure on CCA missions poses significant risk to force health and readiness.

3. (U) Performance Attributes

a. (U) NSWG-4 requires a series of technologies to address CCA shock mitigation to decrease the orthopedic and traumatic brain injuries to craft operators. The Shock Mitigation System should address all four deficiencies listed above.

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Operational Deficiency Report for the Combatant Craft Assault (cont'd)

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Subj: (U) OPERATIONAL DEFICIENCY REPORT (ODR) FOR CREW SHOCK MITIGATION SYSTEM ON COMBATANT CRAFT ASSAULT (CCA)

(1) (U) The selected solution should protect the operator from accelerations in all three axes and may include a combination of shock seating with an optional Head and Neck Support (HANS) or similar device, similar to NASCAR and Professional High Speed Boat Racing. Shock isolation seats or system shall be laboratory tested in accordance with NAVSEA T9006-AE-TRQ-010 in all three axes. Reduction of Modified Neck Injury loading values to < 0.7 (T) / < 0.1 (O) during maximum shock peak, and achieve shock mitigation ratio (MR) of < 0.6 (T) / < 0.1 (O). Testing shall include Anthropomorphic Test Devices with SWCC-assigned Head Supported Mass (HSM) (i.e. helmets, goggles, headsets, etc.) to measure Compression, Tension, Flexion, Extension, etc., to mitigate injuries. (Enclosure 2).

(2) (U) The selected solution may include a modification to the CCA control console that in combination with the shock mitigation, forces operators to be in the most advantageous ergonomic posture.

(3) (U) The selected solution should include shock sensors and decision aid that advises the operators of actual shock magnitude and therefore can be used to operate the craft in a different fashion, mission dependent.

(4) (U) Active Ride Control integrated systems may be one part of the solution. Craft mechanical advantages could improve performance and quality of ride for Operators and passengers.

b. (U) Additional considerations:

(1) (U) Must factor in the craft performance parameters and limitations such as the space within the cockpit.

(2) (U) Shall not interfere with the ability to egress, manipulate controls and perform routine functions.

(3) (U) Shall enable operators to perform all normal operational functions while wearing SWCC-assigned Level 4 ballistic protection, operational gear, and Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) personnel protective equipment.

(4) (U) Should maintain or improve on visual sightlines for safe navigation without increasing craft's Radar signature.

(5) (U) Shall be form, fit, function and conform to current craft inventory by integration into the craft while being utilized for high and low speed transits.

(6) (U) Shall accommodate both male and female operators from varying heights and weights representative of the force.

(7) (U) Should be easily removable to change configuration or repairs of equipment.

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Operational Deficiency Report for the Combatant Craft Assault (cont'd)

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Subj: (U) OPERATIONAL DEFICIENCY REPORT (ODR) FOR CREW SHOCK MITIGATION SYSTEM ON COMBATANT CRAFT ASSAULT (CCA)

(8) (U) Shall be supplied for the operators at threshold (Coxswain/Boat Captain, Navigator, and Engineer) and objective (12 passengers).

(9) (U) Shall allow unrestricted access to bow compartment via crew compartment access hatch.

(10) (U) Shall be in accordance with the requirements in MIL-STD-810H standard for:

(a) (U) Vibration mitigation: For craft survivability and materiel reliability, the System shall survive High Speed Craft (HSC) vibrations for HSC Profiles I and II.

(b) (U) Thermal mitigation: For environmental survivability and reliability, the System shall survive CCA hot and cold temperature and humidity environments, during use and storage.

(c) (U) Dust/Water Ingress Protection (IP) mitigation: For environmental survivability and reliability, the System shall be IP66 (T) and should be IP68 (O) for any sensitive &/or critical components (e.g. data recording/storage, any electrical &/or logical connectors, any hydraulics/pistons in which contamination may fail the device, etc.).

(d) (U) Icing mitigation: System must operate in all icing conditions.

(e) (U) Salt Fog Corrosion Prevention: For environmental survivability and materiel reliability, the System must be constructed of corrosion resistant materials and/or coatings.

4. (U) Potential Solutions

a. (U) Seats that allow for various positions, including the naturally balanced, semi-standing, full seated posture used in motorcycle riding, with full vertical and lateral support.

b. (U) Develop centralized data analysis monitoring and reporting of Craft and Crew Shock/WBV exposures.

c. (U) Active Ride Control system for reduction of shock, vibrations, and increased craft stabilization in various sea states.

d. (U) Head and Neck Support (HANS) Devices (e.g. www.HANSdevices.com).

e. (U) Recommend market analysis of proven and experimental technology

5. (U) ODR Close Out Criteria

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Operational Deficiency Report for the Combatant Craft Assault (cont'd)

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Subj: (U) OPERATIONAL DEFICIENCY REPORT (ODR) FOR CREW SHOCK MITIGATION SYSTEM ON COMBATANT CRAFT ASSAULT (CCA)

a. (U) Objective 1. Equip and instrument three (3) shock mitigation systems on a single CCA for Coxswain/Boat Captain, Navigator, and Engineer, with integrated data recording, processing and evaluation equipment. These three systems should be different so as to select the best overall shock mitigation system. Test shock mitigation system and establish craft baseline shock data sets for various sea states and maneuvers.

b. (U) Objective 2. Integrate test and evaluate an Active Ride Control system for effectiveness to reduce shock and vibrations in various sea states.

c. (U) Objective 3. Integrate and test/evaluate a shock sensor and recording device for effectiveness.

d. (U) Objective 4. Conduct safety review and analysis of the HANS device to determine suitability for use in the maritime environment.

e. (U) Objective 5. Develop ECP for integration of technologies to effectively reduce operator impact and injuries.

6. (U) Return on Investment. The Crew Shock Mitigation System will Reduce Risk to Force, Increase Operational Availability (Ao) and reduce if not eliminate loss workdays and prevent the loss of SWCC Operators to single impact events.

7. (U) Reduce Risk to Mission. These solutions significantly reduce the risk to force for SWCC Operators during low and high-speed transits in varying sea states. Reduces standing load and increases operator longevity. Decreasing operator injuries strengthens combat readiness directly supporting NSW NAVPLAN 24.

8. (U) Mission Banding. Critical.

9. (U) Mission Banding Justification. Risk to force operating under current conditions degrades health and readiness, and will continue the severely injure if not disable operators.

J. T. GREEN

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